

PENNSYLVANIA RAILROAD, AMTRAK BRIDGE NO. 7.80
(Pennsylvania Railroad, Sawtooth Bridge No. 7.80)
Carrying two Northeast Corridor tracks over the New Jersey Transit
Corporation Morris & Essex Line
Kearny
Hudson County
New Jersey

HAER NJ-160
HAER NJ-160

PHOTOGRAPHS
WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Interior Region 1, North Atlantic - Appalachian
U.S. Department of the Interior
1234 Market Street, 20th Floor
Philadelphia, PA 19107

HISTORIC AMERICAN ENGINEERING RECORD

PENNSYLVANIA RAILROAD, AMTRAK BRIDGE NO. 7.80

(Pennsylvania Railroad, Sawtooth Bridge No. 7.80)

HAER No. NJ-160

Location: The “Sawtooth Bridges,” (Amtrak Bridge No. 7.80 and Amtrak Bridge No. 7.96) are located along an approximately 1.1-mile-long segment of the Northeast Corridor line (NEC), north of the Passaic River between Amtrak milepost (MP) 8.3 (Hudson Interlocking) and MP 7.2 (Swift Interlocking) in the Town of Kearny, Hudson County, New Jersey.

Amtrak Bridge No. 7.80 is the northeasterly of the two Sawtooth Bridges. The western end of the bridge is located at 40.743708, -74.126140, while the eastern end is located at 40.744069, -74.124122. The bridge carries two NEC tracks over four New Jersey Transit Corporation (NJ TRANSIT) rail tracks that serve the NJ TRANSIT Morris & Essex Line, which is part of the New Jersey and National Register of Historic Places (NJ/NR)-eligible Old Main Delaware Lackawanna & Western Railroad Historic District. Amtrak Bridge No. 7.80 also spans an unnamed tributary to the Passaic River.

Present Owner: The National Railroad Passenger Corporation (Amtrak) is the owner and operator of the Sawtooth Bridges.

Present Use: Amtrak Bridge No. 7.80 is currently in use as a railroad bridge that carries Amtrak’s NEC over NJ TRANSIT’s Morris & Essex Line and over an unnamed tributary to the Passaic River.

Significance: The Sawtooth Bridges are contributing elements within the Pennsylvania Railroad (PRR) New York to Philadelphia Historic District, which was determined eligible for the National Register of Historic Places (NR) in 2003. While they were not specifically identified in prior documentation of the Historic District as contributing elements, in the context of the Sawtooth Bridges Replacement Project, the New Jersey Historic Preservation Office (NJHPO) found that the bridges contribute to the significance of the PRR Historic District.

The PRR New York to Philadelphia Historic District was determined NR-eligible under Criterion A in the areas of transportation and commerce and under Criterion C for its engineering features. The Historic District consists of a roughly 75-mile-long linear corridor in New Jersey which extends from the Hudson River tunnels in Weehawken, Hudson County, on the east, to Trenton, Mercer County, to the west. The period of significance for the Historic District extends from 1835 to 1969. Contributing resources include embankments, cuts, bridges, culverts, stations, interlocking towers, and overhead catenary systems.

The section of the Historic District in which the Sawtooth Bridges are located is an extension of the PRR, built over the first decade of the twentieth century as part of the New York Improvements, also known as the New York Tunnel Extension Project. It consisted of eight miles of electrified rail line between Midtown Manhattan and Newark, New Jersey and included the construction of New York's Pennsylvania Station and PRR tunnels beneath the Hudson River between New York and New Jersey. The project also included the construction of several bridges that carry the railroad over water, marsh, and other railroads. The Sawtooth Bridges (Amtrak Bridges 7.80 and 7.96) were designed in 1906 and constructed circa 1907 as part of this project. The bridges' name "Sawtooth" is derived from their sawtooth-like appearance in plan, which is the result of the decking that supports the bridges as they cross over other rail lines.

Historian: This documentation was prepared by Molly McDonald, MA, AKRF, Inc., with contributions by Elizabeth D. Meade, PhD., AKRF, Inc., in April 2024.

Project Information: This recordation is being performed in connection with Amtrak's Sawtooth Bridges Replacement Project. The Project will entail the removal of the existing Sawtooth Bridges (Amtrak Bridges 7.80 and 7.96) and the construction of three new rail-carrying bridges resulting in a new four-track segment of the NEC with higher design speeds. The increasing age of the existing Sawtooth Bridges, their poor structural condition, and their two tracks (which are restricted to 60 miles per hour) limit the efficiency and reliability of rail operations throughout this segment of the NEC. The purpose of the Proposed Project is to achieve a state of good repair and to improve the reliability and resiliency of rail service along this critical segment of the NEC while preserving the current functionality of Amtrak's NEC service and NJ TRANSIT's commuter rail service.

The Federal Railroad Administration (FRA) is providing funding for design and environmental review of the project and is serving as the lead federal agency under Section 106 of the National Historic Preservation Act (NHPA). FRA and Amtrak prepared an Environmental Assessment (EA) for the project in accordance with the National Environmental Policy Act (NEPA) and undertook consultation pursuant to Section 106. FRA signed the EA on February 27, 2020 and following a public comment period, FRA signed a Finding of No Significant Impact (FONSI) on August 27, 2020.

As part of the Section 106 consultation for the project, FRA in consultation with the New Jersey Historic Preservation Office (NJHPO), determined that the project will have an adverse effect on the PRR New York to Philadelphia Historic District due to the removal of the contributing Sawtooth Bridges. Amtrak signed a Programmatic Agreement (PA) with the FRA and NJHPO on May 21, 2020, which identified measures to avoid, minimize, and mitigate the Project's adverse effects on historic properties. Among the stipulations set forth in the PA was the Historic American Engineering Record (HAER) documentation of the Sawtooth Bridges as mitigation of the adverse effect of the Project on the PRR New York to Philadelphia Historic District.

Part I. Historical Information

A. Physical History:

1. Date of Construction: Ca. 1907

2. Architect/ Engineer: Based on original plans and elevations for the Sawtooth Bridges on file in Amtrak's archives, the design of the bridges was the product of the Pennsylvania Railroad's engineering office. The plans are signed by A. Shand, Chief Engineer for the Meadows Division and H. R. Leonard, Chief Engineer of Buildings and Bridges.

Alexander Shand (1858-1930) was born in Scotland, began his employment for the Pennsylvania Railroad in 1879, and gradually worked his way into increasingly higher positions with the company during his many years employed there.¹ Shand was promoted from Assistant Chief Engineer to Chief Engineer of the Meadows Division in 1906, following the retirement of William H. Brown, who had formerly served that role for many years.²

Henry Read Leonard, Sr. (1859-1939), served in his position with the PRR beginning in 1902 and retained it for 26 years until his retirement at age 70. He began his career in the City Engineer's office of his native city of Boston and was subsequently employed with the Southern Railway Company. Leonard was considered "one of the country's foremost structural engineers."³ His obituary stated that he "was in charge of the construction of many of the giant spans carrying the Pennsylvania's main lines from New York to Chicago and St. Louis."⁴

3. Builder/ Contractor/ Supplier: A detailed set of structural steel shop drawings for both Sawtooth Bridges are on file in Amtrak's Engineering Archive. These 1907 plans indicate that McClintic-Marshall Construction Co. of Pottstown, PA, provided the structural steel components of the bridges.⁵ According to a contemporary newspaper account, McMullen & McDermott constructed all bridge abutments associated with the New York Tunnel

¹ "Popular Appointment," *Buffalo Enquirer*, June 2, 1903, 6.

² "PRR Chief Engineer to Retire, Having Reached 70," *The Sun*. March 1, 1906, 3.

³ "PRR Chief Engineer to Retire Tomorrow," *Courier-Post*, April 30, 1928, 3.

⁴ "Henry R. Leonard, Engineer, Dies," *The Philadelphia Inquirer*, January 12, 1939, 7.

⁵ McClintic-Marshall Construction Co. *Bridge for Penna. New Jersey & New York R.R. over D.L. & W. R.R. Tracks, East of Harrison, NJ*, February 15, 1907. On file in Amtrak's Engineering Archives, Philadelphia, PA; McClintic-Marshall Construction Co. *Bridge for Penna. New Jersey & New York R.R. over New York Div. P.R.R. Tracks, East of Harrison, NJ*, February 12, 1907. On file in Amtrak's Engineering Archives, Philadelphia, PA.

Extension project, and the B.M. & J.F. Shanley firm, of Newark, constructed all site work “west of Secaucus except the bridge abutments.”⁶ Historic directories indicate that Arthur McMullen and Charles H. McDermott’s contracting company was based in Washington, DC.⁷

4. Original plans and construction: Plans for Amtrak Bridges 7.80 and 7.96 on file in Amtrak’s Engineering Archives in Philadelphia, PA, include several initial plans for the bridges dated to 1905;⁸ original final contract drawings dated to December of 1906;⁹ a detailed set of structural steel shop drawings of 1907,¹⁰ and as-built drawings dated to 1908 (Pennsylvania Railroad [PRR] 1908).¹¹ The 1905 drawings reflect multiple revisions to the originally conceived alignment and illustrate the rerouting of a “ditch” (an unnamed tributary of the Passaic River) to pass beneath Amtrak Bridge 7.80. The 1906 original plan drawings are signed by A. Shand, Chief Engineer for the Meadows Division and/or H. R. Leonard, Chief Engineer of Buildings and Bridges. Masonry Plans for each of the bridges illustrate details relating to the stepped concrete abutments.¹² Another 1906 drawing shows

⁶ “Progress of the P.R.R. Tunnel,” *The Jersey City News*, June 2, 1906, 1.

⁷ R.L. Polk & Co., *Boyd’s Directory of the District of Columbia for 1908*, 1908, 75.

⁸ Pennsylvania Railroad *P.N.J. & N.Y.R.R. Revised Location Plan for Bridge over P.R.R. Morris & Essex Div. of D.L. & W. R.R., East of Harrison, NJ*, October 27, 1905. On file in Amtrak’s Engineering Archives, Philadelphia, PA; Pennsylvania Railroad *P.N.J. & N.Y.R.R. Revised Location Plan for Bridge over P.R.R. Morris & Essex Div. of D.L. & W. R.R., East of Harrison, NJ*, November 15, 1905. On file in Amtrak’s Engineering Archives, Philadelphia, PA; Pennsylvania Railroad *P.N.J. & N.Y.R.R. Location Plan for Bridge over P.R.R. Morris & Essex Div. of D.L. & W. R.R., East of Harrison, NJ*, August 31, 1905. On file in Amtrak’s Engineering Archives, Philadelphia, PA.

⁹ Pennsylvania Railroad *Bridge carrying Tracks of Penna. New Jersey & New York R.R. over D. L. and W. R. R. Tracks, East of Harrison, NJ*, December 1906. On file in Amtrak’s Engineering Archives, Philadelphia, PA; Pennsylvania Railroad *Bridge carrying Tracks of Penna. New Jersey & New York R.R. over New York Div. (P. R. R.) Tracks, East of Harrison, NJ*, December 1906. On file in Amtrak’s Engineering Archives, Philadelphia, PA.

¹⁰ McClintic-Marshall Construction Co., *Bridge for Penna., 1907*.

¹¹ Pennsylvania Railroad *Plan of Bridges to Carry P.T. & T.R.R. over N.Y. Div P.R.R. and D.L. & W. R.R., East of Harrison NJ, As Built*, October 10, 1908. On file in Amtrak’s Engineering Archives, Philadelphia, PA.

¹² Pennsylvania Railroad, Office of Chief Engineer, PNJ & NY RR. 9446, *Masonry Plan of Bridges to carry Penna New Jersey & New York RR, New York Div. (P.R.R.) Tracks and D.L.& W.R.R. Tracks, East of Harrison*, March 2, 1906. On file in Amtrak’s Engineering Archives, Philadelphia, PA.

the arrangement of piles underlying the abutments.¹³ As-built drawings, dated 1908, illustrate the bridges in plan and section and include details on the abutments and piles.¹⁴ Later plans of the bridges are also filed in Amtrak's archive, including 1947 beam strengthening plans for each bridge;¹⁵ 1964 steel inspection drawings, which depict and label each girder of the bridges;¹⁶ and 1981 Rehabilitation Plans.¹⁷

5. Alterations and additions: The Sawtooth Bridges were subject to two principal repair campaigns since their ca. 1907 construction: in 1947 and 1981, respectively. Based on contract drawings dated January 31, 1947, the repairs at that time included reinforcement of floor beam bottom flanges and through-girders with welded plates; replacement of rivetheads either with new rivets or rebuilt by welding; and painting of all exposed steel.¹⁸

Based on a second set of contract drawings, additional repairs to the superstructure and abutments occurred in 1981. These included the installation of a new waterproofing membrane and a protective course over the entire superstructure; replacement of the railing along the top of the bridge, sandblasting and painting of the exposed structural steel; strengthening of selected columns, installation of deck drains; bearing repairs; and the repair of concrete decks, abutments, and other concrete elements.¹⁹

¹³ Pennsylvania Railroad *P.N.J. & N.Y.R.R. Arrangement of Piles, West Abutment, Bridge over NY Div.*, October 24, 1906. On file in Amtrak's Engineering Archives, Philadelphia, PA.

¹⁴ PRR, *Plan of Bridges*, 1908.

¹⁵ Pennsylvania Railroad, Office of Engineering, Bridges and Buildings *Bridge No. 7.80, East of Harrison, New Jersey: Reinforcement of Steel Beams*, Sheet IA. January 31, 1947. On file in Amtrak's Engineering Archives, Philadelphia, PA.

¹⁶ Pennsylvania Railroad *Bridge 7.80, East of Harrison: Steel Inspection*, February 24, 1964. On file in Amtrak's Engineering Archives, Philadelphia, PA.

¹⁷ Federal Railroad Administration (FRA), *Northeast Corridor Improvement Project: Section Improvements FHB, Hunter to Hudson, Amtrak Work Package No. AB-102, Construction Project No. ZB4CFDA, Bridge N.J. 7.80 over Erie-Lackawanna R.R.* Plans prepared by Frederic R. Harris, Inc. and Deleuw Cather/Parsons for Amtrak and FRA. 1981. On file in Amtrak's Engineering Archives, Philadelphia, PA.

¹⁸ Pennsylvania Railroad, 1947; Hardesty & Hanover, LLP, *Special Detailed Inspection and Load Rating Report: Bridge No. 7.80 Amtrak over DL&W RR, City of Harrison, Hudson County, New Jersey*, Prepared by Hardesty & Hanover, LLP, Consulting Engineers for National Railroad Passenger Corporation, October 1999.

¹⁹ Hardesty & Hanover, *Special Detailed Inspection*, 2.

B. Historical Context

Historical Overview of the Vicinity

Prior to European colonization, the area that includes present-day Kearny and Harrison, New Jersey had been the territory of the indigenous Hackensack, a Lenape group. It became part of the British Province of New Jersey following the Dutch surrender of Fort Amsterdam in 1664. The Plantation of New-Ark (Newark) was established in 1666 a short distance west of present-day Harrison and Kearny. Shortly thereafter, Major Nathaniel Kingsland, the owner of a sugar plantation in Barbados, purchased 30,000 acres from the East Jersey Proprietors. He conveyed the southern portion of the land, including present-day Harrison and Kearny, to his nephew, William Sanford, who named his New Jersey plantation New Barbados. The area was known as New Barbados Neck for well over a century. Colonial-period settlement in the vicinity was sparse due in part to the extensive marshes that characterized the area. The Schuyler family, among other colonial settlers, established manors in the higher elevation areas to the north. In 1719, Arent Schuyler discovered copper in what is now Kearny, which prompted some initial settlement and the construction of new roads in the vicinity.²⁰ By the late eighteenth century, interest increased in improving transportation networks between Newark and Jersey City (which had ferry connections to Manhattan), and the state legislature approved the construction of several turnpikes which traversed the area.²¹ In 1802, William Halsey laid out a town along one of these turnpikes; the town eventually became the Town of Harrison. Development in the area progressed slowly until a series of railroad companies constructed lines through the area several decades later.

Transportation continued to represent a major factor in the area's development due to its location between Newark and Jersey City. Increasingly, New Jersey became a crucial corridor for transporting products and material—including grain, lumber, meat, and other regional exports—to nearby cities. Myriad transportation networks developed, most of which were oriented in a northeast-southwest direction connecting New York City and Philadelphia. In 1824, the New Jersey Legislature chartered the Morris Canal and Banking Company, a corporation charged with constructing the Morris Canal. Completed in 1831, the canal connected the upper Delaware River with Newark and Jersey City. Canals quickly superseded roadways as routes for the transport of goods, particularly anthracite coal from Pennsylvania.²² In a matter of a few decades, railroads overtook canals in importance. The New Jersey Railroad Company constructed the first railroad in the area in the second quarter of the nineteenth century and several other railroad companies

²⁰ Daniel Van Winkle, editor-in-chief, *History of the Municipalities of Hudson County, New Jersey 1630-1923*, Volume I. Lewis Historic Publishing Company, Inc. 1924, 83-84.

²¹ Hunter Research, *Combined Phase 1A Archaeological Study and Intensive-Level Architectural Survey: I-280 Ramps Improvement Project, Town of Harrison, Hudson County, NJ*, Prepared for Hudson County Improvement Authority and Jacobs Engineering Group. April 2013. Vols. 1 and 2, Vol.1, 4-6.

²² Wheaton J. Lane, *From Indian Trail to Iron Horse: Travel and Transportation in New Jersey, 1620-1860*, Princeton University Press, 1939: 162, 381.

followed suit in the third quarter, transforming the area from undeveloped meadowlands to a busy transportation corridor. In 1867, the New Jersey Legislature created the independent Township of Kearny out of the existing Township of Harrison.²³

Through much of the nineteenth century and into the twentieth century, the low-lying marsh areas of Harrison and Kearny remained largely undeveloped, with the exception of the roads and railroads that traversed them. During the last quarter of the nineteenth century, the area experienced rapid industrial, commercial, and residential development due to advances in land-making technology as well as expanding transportation routes. Several major industries, including multiple thread and textile mills, operated in Kearny by the third quarter of the nineteenth century.²⁴ The World War I era brought a further boost in the industrial development of the area. The Crucible Steel Company in Harrison and other industries, initially established for wartime production, persisted after the war.²⁵

In the 1930s, discussions began in support of constructing a major highway from Boston to Washington. Momentum dissipated with the advent of the Great Depression but resumed in the mid-1940s. In 1948, the State Legislature enacted the New Jersey Turnpike Authority Act, which created the New Jersey Turnpike Authority to oversee the planning, construction, and maintenance of the highway. The construction of the roadway, which runs north-south immediately east of the Sawtooth Bridges, was completed in 1952.²⁶

Nineteenth Century Railroad Development in Vicinity

Railroads came to dominate transportation in the nineteenth century, and New Jersey was at the forefront of railroad construction in the United States. As rail lines between New York City and New Jersey proliferated over the course of the nineteenth century and the early twentieth century, the low-lying land in Harrison and Kearny between the Hackensack and Passaic Rivers became a critical but confined corridor where several railroads converged, running parallel and in close proximity to one another.

In 1832, the incorporation of the New Jersey Rail Road and Transportation Company (NJRR) spurred the construction of a direct rail line between Trenton, New Jersey and New York City via a terminal and ferry located in Jersey City.²⁷ The NJRR was the third rail company to be established in the state (after the Camden and Amboy Railroad and the Paterson and Hudson River Railroad). The marshland in Kearny and Harrison complicated construction of the NJRR, requiring

²³ Hunter Research, *Combined Phase 1A*, Vol. 1, 4-3.

²⁴ "History of the Town of Kearny," Town of Kearny website: <https://www.kearnynj.org/history-of-the-town-of-kearny/>, 2018. Accessed April 2024.

²⁵ Van Winkle, "History of the Municipalities of Hudson County," 373.

²⁶ Jeremy F. Plant, editor, *Handbook of Transportation Policy and Administration*, Associate editor: Van R. Johnson, Assistant editor: Cristina E. Ciociclan, CRC Press, 2007, 113.

²⁷ Loretta Treese, *Railroads of New Jersey: Fragments of the Past in the Garden State Landscape*, Stackpole Books, 2006, 98.

the crossing to utilize pile-supported fill. The NJRR constructed a passenger depot in Harrison at 6th Street just west of the present location of the Sawtooth Bridges.²⁸

The 1835 charter of the Morris & Essex (M&E) Railroad intended to connect the New Jersey city of Morristown with New York (a distance of roughly 30 miles), yet the construction extended only between Morristown and Newark (approximately 10 miles short of the Jersey City Hudson River crossing to New York). In 1836, the NJRR agreed to carry M&E traffic between Newark and Jersey City. A horse-drawn connecting line provided the transfer between the railroads in Newark.²⁹

Meanwhile, in 1841 the NJRR leased the ferry operations that connected it to major cities, enhancing the railroad's success; the NJRR subsequently purchased the ferries twelve years later.³⁰ In its first decades, the NJRR primarily served as a passenger line which formed a critical link between New York City and Philadelphia. It served commuters traveling between Newark and Manhattan and earned a reputation for comfort and convenience.³¹

In 1855, the M&E Railroad built its own branch line between Newark and Harrison, streamlining the connection with the NJRR. The new M&E line merged with the NJRR in Harrison just west of the current location of the Sawtooth Bridges. Meanwhile, the NJRR constructed a new more direct route between Harrison and Newark in 1856, which included a new Passaic River crossing. The 1856 route became the NJRR main line, while the original route continued to carry traffic but was used primarily as a freight bypass. The NJRR's original alignment through the area is no longer in rail use but follows the alignment of Railroad Avenue in Harrison and an Amtrak service road immediately west of the Sawtooth Bridges.³² The NJRR carried 2.8 million passengers in 1860. In the 1860s, the M&E constructed its own connection east of Harrison across the Meadowlands to a ferry terminal in Hoboken.³³ In 1868, the Delaware, Lackawanna, and Western Railroad (DL&WRR), which had formed in 1853 for carrying coal from Pennsylvania to the east coast, leased the M&E Railroad, including all of its branches. With the M&E line, the DL&W RR was able to connect to the Port of New York and was thus transformed from a regional coal-carrying line to a major railroad with both freight and passenger service.³⁴

The Camden and Amboy Railroad, which had originally been chartered in the 1830s, and the NJRR were consolidated as the United Canal and Railroad Companies of New Jersey in 1867. In 1871, the Pennsylvania Railroad (PRR) leased the consolidated company, and thus acquired a continuous route from New York to Philadelphia.³⁵ The PRR completed an improved route, which more closely followed the current Northeast Corridor alignment, in 1863 enabling a 2.5-hour trip

²⁸ Hunter Research, Vol. 2, 324.

²⁹ Hunter Research, Vol. 1, 4-10.

³⁰ Treese, *Railroads of New Jersey*, 98.

³¹ Lane, *From Indian Trail to Iron Horse*, 314.

³² Hunter Research, Vol. 1, 4-6.

³³ Hunter Research, Vol. 1, 4-10.

³⁴ Lane, 381.

³⁵ Treese, 3.

between Trenton and New York City. In 1885, the PRR began passenger service between New York and Washington, D.C., via Philadelphia. By the turn of the twentieth century, the PRR had become one of the most powerful rail lines in the northeastern United States.³⁶

In 1901, six railroad companies, including the PRR, operated ferry depots for Hudson River crossings because no rail bridges or tunnels had yet been constructed between New Jersey and New York City.³⁷ Early attempts at tunneling under the Hudson River to create a direct rail connection to Manhattan began in the late nineteenth century. In 1873, engineer Dewitt Haskin founded the Hudson Tunnel Company envisioned as part of a Hudson and Manhattan Railroad project. Work on a first tunnel (now called the Uptown Hudson Tubes) began in 1873, but due to lack of funds, fatal accidents, and lawsuits, the initial attempt was abandoned for decades.³⁸

The Pennsylvania Railroad's New York Improvements

The final period of major expansion for the Pennsylvania Railroad occurred in the early twentieth century. The keynote project of this period, the New York Improvements (also known as the New York Tunnel Extension Project), built between 1902 and 1910, created direct service between Newark and Manhattan by tunneling under the Hudson River. The new Hudson River tunnels would finally eliminate the need for railroad ferries carrying passengers and goods from New Jersey to New York City. Another aspect of the project entailed an East River crossing between Manhattan and Long Island, connecting to the Long Island Railroad (LIRR). The PRR established subsidiaries to manage the project. The Manhattan to New Jersey section was the Pennsylvania, New York and New Jersey Railroad and the Manhattan to Long Island section was the Pennsylvania, New York and Long Island Railroad.

The New York Improvements between Manhattan and New Jersey consisted of eight miles of a new electrified double track line across the Meadowlands to Bergen Hill in Weehawken, the construction of tunnels beneath the Hudson River from Weehawken to Manhattan, and the construction of Pennsylvania Station in Manhattan.³⁹ Pennsylvania Station, on the west side of Midtown Manhattan, was designed in the Beaux-Arts style by McKim, Mead and White. The tracks traversed the meadows of Secaucus and wound around the rocky outcrop, Snake Hill, on an elevated earthen embankment, crossing the Hackensack River on a swing bridge (Portal Bridge), extending west through Kearny where they were carried over existing rail lines on the Sawtooth Bridges. Electrified rail was used on the line to avoid steam locomotive exhaust in the Hudson

³⁶ Jill Jonnes, *Conquering Gotham. A Gilded Age Epic: The Construction of Penn Station and Its Tunnels*, Viking, 2007: 13, 44, 136.

³⁷ Jonnes, *Conquering Gotham*, 13.

³⁸ Albert J. Churella, *Pennsylvania Railroad, Vol. I: Building an Empire, 1846-1917*, University of Pennsylvania Press, 2013, 751.

³⁹ Jonnes, *Conquering Gotham*; William Couper, *History of the Engineering Construction and Equipment of the Pennsylvania Railroad Company's New York Terminal and Approaches*, Isaac Blanchard Co., 1912.

Tunnels.⁴⁰ The electrified rail extended from Manhattan only as far west as Harrison, a stretch known as the Meadows Division.⁴¹

A major railyard known as Manhattan Transfer, built on the Harrison-Kearny line immediately west of the Sawtooth Bridges, handled the transition between electric and steam.⁴² At Manhattan Transfer, passengers switched between steam and electric locomotives. The facility included a passenger station and two platforms (no longer extant) as well as Hudson Tower (still standing). Hudson Tower, part of a system of interlocking towers, controlled the movement of PRR trains between New Jersey and New York. Manhattan Transfer operated at full capacity from 1910 until 1937, a few years after full electrification of the line from New York to Philadelphia was achieved.⁴³

During the planning phase of the New York Improvements, the PRR had vacillated on whether to use direct current (DC) or alternating current (AC) to supply electric traction power to the new electrified line. The final decision was in favor of a low-voltage DC system, which was perceived as the safer and more familiar option. However, shortly after the completion of the New York Improvements, other pioneering projects elsewhere in the United States and Europe demonstrated the advantages of an AC system. When the PRR undertook a widespread electrification program in the 1920s and early 1930s, they used the AC system and applied this to the entire route between New York and Philadelphia.⁴⁴

The Hudson Tunnel Extension opened for service late in the year 1910. The project cost over one hundred million dollars, according to a newspaper report.⁴⁵ Contemporary accounts in newspapers and journals marveled at the speed of the trip from Harrison to New York, the engineering feats of the Hudson Tunnels and the electrification of the line, and at the impressive architecture of Penn Station in New York.

Other railroads followed closely on the PRR's heels with plans to tunnel under the Hudson River. In 1905, the Hudson Companies incorporated with the dual purpose of completing the "Uptown Tubes," which had been partially constructed in the 1870s as the Hudson and Manhattan Railroad project, and constructing "Downtown Tubes" to link Lower Manhattan (Cortlandt Street) and Jersey City (Exchange Place). The Hudson Companies completed the Uptown Tubes in 1906. Construction of the Downtown Tubes began in 1905 and lasted four years. The Hudson Companies operated these lines as the Hudson & Manhattan (H&M) Railroad, the precursor to PATH. In 1906, the PRR made an agreement with the H&M allowing the latter to offer service between Jersey City

⁴⁰ Hunter Research, Vol. 1, 4-20.

⁴¹ Couper, *History of the Engineering Construction*, 33.

⁴² American Society of Civil Engineers, *New York Tunnel Extension: The Pennsylvania Railroad*, Volume 2, New York: American Society of Civil Engineers, 1910, 227.

⁴³ Hunter Research, Vol. 1, 4-20.

⁴⁴ Churella, *Pennsylvania Railroad*, Vol. I, 790.

⁴⁵ "The Pennsylvania Railroad Company," *Wall Street Journal*, March 2, 1910, 6.

and Newark, sharing the original PRR right-of-way, which originated with the NJRR, through the Meadowlands.⁴⁶

Having completed the New York Improvements and electrification, the PRR cemented its status as a critical link in both local and regional rail systems, enabling it to secure a dominant place in the nation's busiest port and establishing itself as the country's largest railroad during the twentieth century. However, by the mid-twentieth century, the advent of highways and motor vehicle traffic again transformed transportation systems in New Jersey and beyond. As popularity of railroads began to decline and the Great Depression ensued, railroad companies struggled. The H&M fell into financial distress and ultimately filed for bankruptcy in 1954. The Port Authority, preparing to embark on the construction of the World Trade Center, took control of the company in 1962 and named it PATH. In 1968, the PRR merged with a long-time competitor, the New York Central Railroad, to form the Penn Central Railroad, a short-lived company that filed for bankruptcy in 1970. Amtrak, founded in 1971 to operate passenger rail, acquired much of the NEC by 1976, including the former PRR line between New York and Philadelphia, the former Meadows Division, and the Sawtooth Bridges.

Sawtooth Bridges

As described above, the Sawtooth Bridges were constructed as part of the PRR's early twentieth-century New York Improvements Project. The bridges served the purpose of carrying the new electrified double tracks of the Meadows Division through an already congested and geographically constrained rail corridor. Bridge 7.80, the northeasterly of the Sawtooth Bridges, carried the PRR over the M&E tracks, then a part of the DL&WRR (now operated by NJ TRANSIT). Bridge 7.96, the southwesterly bridge, carried the PRR over what was at the time called the PRR New York Division or H&M Railroad (now tracks operated by PATH and Consolidated Rail Corporation (Conrail), respectively).

Based on the original plans for the bridges, which are on file in Amtrak's Engineering Archives, initial plans for both Amtrak Bridge 7.80 and Amtrak Bridge 7.96 date to 1905, and the final drawings date to December 1906, slightly later than some of the other components of the Tunnel Extension Project (PRR 1905; PRR 1906). The plans reflect changes in the PRR's leadership during the design and construction of the Sawtooth Bridges.

Alexander Johnston Cassatt (1839-1906), the seventh president of the PRR, is credited for conceiving and overseeing much of the New York Improvements. Cassatt joined the PRR in 1861 as an engineer and quickly rose through the ranks. During his presidency, he more than doubled the PRR's assets and played a major role in initiating several major expansion projects; most famously, the Tunnel Extension project. Cassatt died in December 1906, before the completion of the New York Improvements, and incidentally, the same month that the Sawtooth Bridges' final design drawings are dated. James McCrea (1848-1913) assumed the presidency upon Cassatt's death and remained in charge to see the completion of the project, dying a few years later in 1913.

⁴⁶ Churella, 762.

A similar transfer of oversight occurred during the same period in the position of Chief Engineer of the Meadows Division. William H. Brown served in the role at the initiation of the New York Improvements, overseeing the first phase of planning and improvements along the corridor including Manhattan Transfer, embankments through the Meadowlands, and a series of bridges.⁴⁷ Brown retired in 1906, and Alexander Shand, a Scotland-born engineer who had worked with the PRR since 1879 assumed the role of Chief Engineer of the Meadows Division. While Brown likely played a role in planning the Sawtooth Bridges, the final design drawings for the bridges are signed by Shand and by H.R. Leonard, who served as Chief Engineer of Buildings and Bridges for the PRR since 1902.

Few contemporary accounts have been found that focus specifically on the design characteristics or construction progress of the Sawtooth Bridges, possibly because these utilitarian structures were upstaged by the more iconic components of the project, such as New York's Penn Station and the swing bridge over the Hackensack River. Several articles charting the progress of the larger Tunnel Extension project describe Manhattan Transfer in Harrison in some detail, but only a few mention the subject bridges individually.

A 1908 article in *Scientific American* provides one of the few direct references to the bridges:

Immediately beyond the eastern end of the [Manhattan Transfer] station the tracks rise on a 0.5 per cent grade to a level of 31.5 feet above the general ground surface, at which they are carried on two skew bridges over the west-bound passenger and Newark freight tracks of the company and over the Morris & Essex Division of the D., L. & W. Railway. The whole of the new line, except at the various crossings of public roads, the Hackensack River, and the tracks of other railways, is carried on an embankment, which varies in height from 26 feet to 32 ½ feet above the surface of the Jersey meadows, the elevation of the latter being generally from 2 to 3 feet above mean tide level. The bridging is exceptionally heavy and costly. In addition to the crossing of the Morris & Essex Division, which is over 600 feet in length, and the bridge over the west-bound passenger tracks and Newark freight tracks, over 400 feet in length, there are bridges over the N. & P. branch of the Erie Railroad; the Greenwood Lake Railroad, the Boonton Branch of the D.L. & W. Railway; and two bridges over the Erie Railroad tracks... and finally, near the western portal of the Bergen Tunnel, the tracks of the New York, Susquehanna & Western and the Northern Railroad of New Jersey have to be bridged.⁴⁸

Another reference in a 1910 article appears to mistakenly describe the Sawtooth Bridges as a single structure: "Through trains for New York leave Harrison on rails passing over the old Pennsylvania tracks on a tremendous concrete bridge."⁴⁹

Contemporary newspaper articles are not conclusive as to whether the Sawtooth Bridges were completed in 1907 or 1908. A 1906 piece in the *Jersey City News* reports that "eleven of the

⁴⁷ Churella, 768.

⁴⁸ "Improvement of the New Jersey-New York Suburban Service -- III," *Scientific American*, September 12, 1908, Vol. XCIX, No. 11: 166.

⁴⁹ "Story of the Tunnels in the Making," *Times Union*, September 8, 1910.

twenty-seven ‘bridges’” between Harrison and the tunnel entrance were completed and work was progressing rapidly on the others.⁵⁰ A 1907 article states: “On the section between Harrison... and the Hudson River, many of the bridges have been constructed, and that over the Hackensack River, largely completed.”⁵¹ An article of May 1908 notes: “The bridges from Harrison to the Hackensack River are either built or else the material is on the ground for their construction and it will only be a matter of a couple of months before every span is in place.”⁵² As-built drawings of the bridges in Amtrak’s Engineering Archive are dated to 1908.⁵³ Several articles attest that by March 1910, all of the bridges were complete.⁵⁴ The new line was fully operational by the end of 1910.⁵⁵

Part II. Structural/ Design Information

A. General Statement

1. Character: Amtrak Bridge No. 7.80 is the eastern of two bridges known as the Sawtooth Bridges, which carry Amtrak’s Northeast Corridor (the former PRR) through a busy transportation corridor where several railroads converge located in the Meadowlands immediately north of the Passaic River in Kearny, New Jersey. Amtrak Bridge No. 7.80 carries two NEC tracks over four NJ TRANSIT rail tracks that serve the M&E Line. The bridge also spans an unnamed tributary to the Passaic River. The bridges’ name “Sawtooth” is derived from their sawtooth-like appearance in plan, which is the result of the decking that supports the bridges as they cross over other rail lines. The staggered viaduct form of the bridges, allowing them to span separate features, is likely their most distinctive design characteristic. The “sawtooth” design allows multiple linear transportation routes to pass one another at different elevations within a constricted corridor. Although the design approach does not appear to have been very common in the early twentieth century, other examples of its use can be found, such as the mid-1950s Conrail Overpass, which carries Conrail tracks over two roadways associated with Interstate 76 in Philadelphia. The concrete and steel materials used in the construction of Amtrak Bridge No. 7.80 are consistent with other railroad bridges of the period.

2. Condition of Fabric: The Sawtooth Bridges were constructed ca. 1907 and underwent repairs in 1947 and a rehabilitation project in the early 1980s to strengthen selected columns, remove concrete encasement from columns, repair bearings, and install waterproofing and deck drains. Despite these rehabilitation efforts, recent inspections of both bridges indicated that the Sawtooth Bridges continue to deteriorate. Amtrak conducted a special inspection and condition survey in 2013 and concluded the Sawtooth Bridges are in poor to very poor condition. The inspection survey noted that deck waterproofing of both Sawtooth Bridges is no longer functioning as intended and seepage coupled with calcite formation have contributed to corrosion of the floor

⁵⁰ “Progress of the P.R.R. Tunnel,” *Jersey City News*, 1.

⁵¹ “Financial,” *Brooklyn Daily Eagle*, March 3, 1908: 17.

⁵² “Pennsylvania ‘Short Line’ to Open Soon,” *Jersey Observer and Jersey Journal*, May 11, 1908: 12.

⁵³ PRR, 1908.

⁵⁴ “The Pennsylvania Railroad Company,” *Wall Street Journal*, 6.

⁵⁵ Churella, 776.

beam webs. Rated capacities of the floor beams indicated that the expected service life of these systems has been reached. While no clear substructure observations showed an inadequate capacity of foundations at either bridge, the piers and abutments are likely founded on timber piles, the condition of which is unknown.

B. Description

Amtrak Bridge No. 7.80 is a two-track, three-span, steel through-girder bridge with a concrete encased floor beam system connected to girders, supported on concrete-encased columns, resting on pile foundations. The bridge is made up of three staggered viaduct structures, each having an overall average length of 196'-0" and a three-span average width of 92'-2."⁵⁶ Due to the unique configuration of the bridge, the total span length between the south abutment stem and the north abutment stem is 90' 8 ⁷/₈" long, and the width of the abutments and piers varies. The overall length of the structure is approximately 475'. The through-girder floorbeam superstructure is supported by steel column pier bents with steel capbeams and concrete gravity abutments. The south and north abutments have a granite block bridge seat.⁵⁷ The tracks consist of continuous welded rail with concrete ties. Existing track centers are approximately 14 feet.

C. Mechanicals/Operation

The Sawtooth Bridges carry two Mainline NEC tracks operated by Amtrak. Track 2 is to the south and is normally eastbound and Track 3 is to the north and is normally westbound. They are located between Swift Interlocking to the east and Hudson Interlocking to the west. The existing tracks are currently operating under speed restrictions of 60 miles per hour due to poor infrastructure conditions. Amtrak Bridge 7.80 spans Tracks 2, 1, 3 and 6 of NJ TRANSIT's Morris & Essex Line. Vertical and horizontal clearances from the bridges to all under-grade tracks are less than standard for New Jersey Transit and Conrail. New Jersey Transit's M&E Track 5 is next to Amtrak Track 3 under the New Jersey Turnpike.⁵⁸

D. Site Information

The Sawtooth Bridges are located along the NEC in the southern portion of the Hackensack Meadowlands and the southwestern portion of the town of Kearny near the eastern border of the town of Harrison (see Figures 1 through 3). The Passaic River is located immediately south of the bridges. The Hackensack River is located approximately one and a half miles to the east. Taken together, the Sawtooth Bridges occupy an approximately 1.1-mile segment of the NEC. Amtrak Bridge 7.96 is situated southwest of Amtrak Bridge 7.80. Amtrak, NJ TRANSIT, Conrail, and PATH own the existing right-of-way along the corridor. The rail corridor is developed with

⁵⁶ Portal Partners, *30% Basis of Design Report: Replacement of the Sawtooth Bridges*, Report prepared by Portal Partners for Amtrak, November 10, 2023, 9.

⁵⁷ Hardesty & Hanover, 1.

⁵⁸ Portal Partners, *30% Basis of Design Report*, 11.

numerous railroad lines at various elevations. The tracks are lined with catenary poles and electric, gas, and telecommunications lines run in the vicinity of the existing railroad tracks.⁵⁹

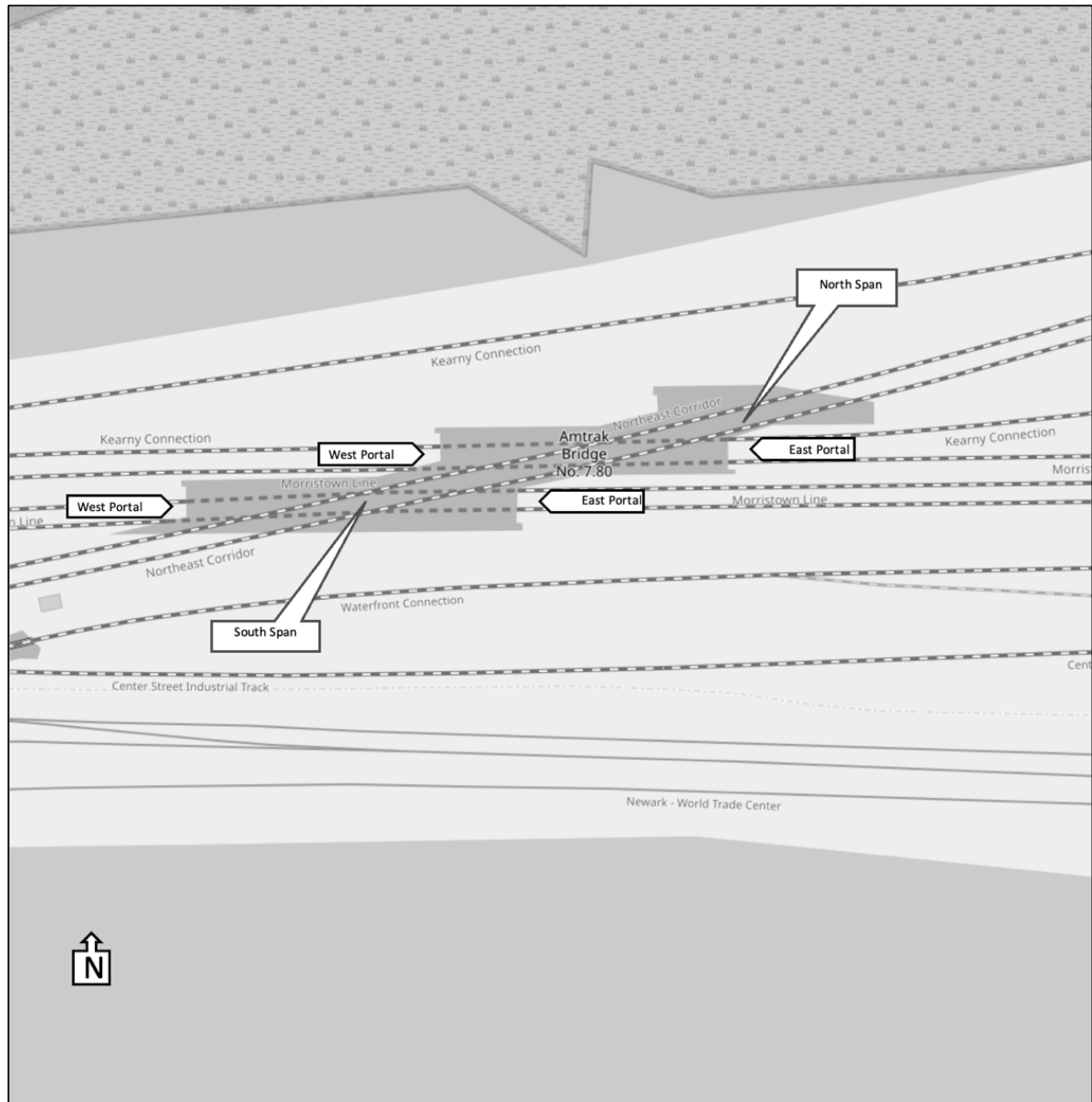
The rail corridor is constructed on landfill placed in the Meadowlands in the nineteenth and twentieth centuries as part of the construction of the existing rail line. It is surrounded by salt marsh and upland areas that are both developed and undeveloped. Development in the immediate vicinity is mainly industrial and transportation related. Immediately east of Amtrak Bridge 7.80, the NEC tracks pass under the New Jersey Turnpike Easterly and Westerly Alignments; specifically, New Jersey Turnpike Authority's Westerly Passaic River Bridge (W107.87) and Easterly Passaic River Bridge (E107.88). A nearly 94-acre landfill (now inactive) owned by the Town of Kearny and the New Jersey Department of Transportation is situated immediately to the north of the railroad corridor.⁶⁰

In addition to the Sawtooth Bridges, other contributing components of the PRR New York to Philadelphia Historic District in the immediate vicinity include catenary systems; Hudson Tower, approximately a half mile west of the Sawtooth Bridges; and Substation 4, approximately 500 feet east of the bridges. Other linear railroad Historic Districts have also been identified in the immediate area, including the NR-eligible Old Main DL&WRR Historic District and the NJRR Historic District.

⁵⁹ Portal Partners, 11-12.

⁶⁰ Portal Partners, 106.

PENNSYLVANIA RAILROAD, AMTRAK BRIDGE NO. 7.80
(Pennsylvania Railroad, Sawtooth Bridge No. 7.80)
HAER No. NJ-160
(Page 16)



Components of Amtrak Bridge No. 7.80

Source: OpenStreetMap.org

Part III. Sources of Information

A. Primary Sources:

Federal Railroad Administration (FRA), *Northeast Corridor Improvement Project: Section Improvements FHB, Hunter to Hudson, Amtrak Work Package No. AB-102, Construction Project No. ZB4CFDA, Bridge N.J. 7.80 over Erie-Lackawanna R.R.*, Plans prepared by Frederic R. Harris, Inc. and Deleuw Cather/ Parsons for Amtrak and FRA. 1981. On file in Amtrak's Engineering Archives, Philadelphia, PA.

McClintic-Marshall Construction Co., *Bridge for Penna. New Jersey & New York R.R. over D.L. & W. R.R. Tracks, East of Harrison, NJ*, February 15, 1907. On file in Amtrak's Engineering Archives, Philadelphia, PA.

McClintic-Marshall Construction Co., *Bridge for Penna. New Jersey & New York R.R. over New York Div. (P.R.R. Tracks, East of Harrison, NJ*, February 12, 1907. On file in Amtrak's Engineering Archives, Philadelphia, PA.

Pennsylvania Railroad, Office of Chief Engineer, PNJ & NY RR, 9446, *Masonry Plan of Bridges to carry Penna New Jersey & New York RR, New York Div. (P.R.R.) Tracks and D.L. & W.R.R. Tracks, East of Harrison*, March 2, 1906. On file in Amtrak's Engineering Archives, Philadelphia, PA.

Pennsylvania Railroad, Office of Engineering, Bridges and Buildings, *Bridge No. 7.80, East of Harrison, New Jersey: Reinforcement of Steel Beams*, Sheet IA, January 31, 1947. On file in Amtrak's Engineering Archives, Philadelphia, PA.

Pennsylvania Railroad, *Bridge 7.80, East of Harrison: Steel Inspection*, February 24, 1964. On file in Amtrak's Engineering Archives, Philadelphia, PA.

Pennsylvania Railroad, *Bridge carrying Tracks of Penna. New Jersey & New York R.R. over D. L. and W. R. R. Tracks, East of Harrison, NJ*, December 1906. On file in Amtrak's Engineering Archives, Philadelphia, PA.

Pennsylvania Railroad, *Bridge carrying Tracks of Penna. New Jersey & New York R.R. over New York Div. (P. R. R.) Tracks, East of Harrison, NJ*, December 1906. On file in Amtrak's Engineering Archives, Philadelphia, PA.

Pennsylvania Railroad, *P.N.J. & N.Y.R.R. Arrangement of Piles, West Abutment, Bridge over NY Div.*, October 24, 1906. On file in Amtrak's Engineering Archives, Philadelphia, PA.

Pennsylvania Railroad, *Plan of Bridges to Carry P.T. & T.R.R. over N.Y. Div P.R.R. and D.L. & W. R.R., East of Harrison NJ, As Built*, October 10, 1908. On file in Amtrak's Engineering Archives, Philadelphia, PA.

Pennsylvania Railroad, *P.N.J. & N.Y.R.R. Revised Location Plan for Bridge over P.R.R. Morris & Essex Div. of D.L. & W. R.R., East of Harrison, NJ*, October 27, 1905. On file in Amtrak's Engineering Archives, Philadelphia, PA.

Pennsylvania Railroad, *P.N.J. & N.Y.R.R. Revised Location Plan for Bridge over P.R.R. Morris & Essex Div. of D.L. & W. R.R., East of Harrison, NJ*, November 15, 1905. On file in Amtrak's Engineering Archives, Philadelphia, PA.

Pennsylvania Railroad, *P.N.J. & N.Y.R.R. Location Plan for Bridge over P.R.R. Morris & Essex Div. of D.L. & W. R.R., East of Harrison, NJ*, August 31, 1905. On file in Amtrak's Engineering Archives, Philadelphia, PA.

Pennsylvania Railroad, *Test Wells at Bridges to Carry Penna. New Jersey & New York R.R. Tracks over D. L. and W. R. R. Tracks, East of Harrison, NJ*, April 21, 1906. On file in Amtrak's Engineering Archives, Philadelphia, PA.

B. Secondary Sources:

American Society of Civil Engineers, *New York Tunnel Extension: The Pennsylvania Railroad*, Volume 2, New York, American Society of Civil Engineers, 1910

Churella, Albert J., *Pennsylvania Railroad, Vol. I: Building an Empire, 1846-1917*, University of Pennsylvania Press: Philadelphia, 2013.

Couper, William, *History of the Engineering Construction and Equipment of the Pennsylvania Railroad Company's New York Terminal and Approaches*, New York: Isaac Blanchard Co., 1912.

Hardesty & Hanover, LLP, *Special Detailed Inspection and Load Rating Report: Bridge No. 7.80 Amtrak over DL&W RR, City of Harrison, Hudson County, New Jersey*, Prepared by Hardesty & Hanover, LLP, Consulting Engineers for National Railroad Passenger Corporation, October 1999.

"Henry R. Leonard, Engineer, Dies," *The Philadelphia Inquirer*, Philadelphia. January 12, 1939: 7.

"Improvement of the New Jersey-New York Suburban Service-- III," *Scientific American*. September 12, 1908, Vol. XCIX, No. 11.

"Financial," *Brooklyn Daily Eagle*, Brooklyn, NY, March 3, 1908, p.17.

"History of the Town of Kearny," Town of Kearny website: <https://www.kearnynj.org/history-of-the-town-of-kearny/>, 2018, Accessed April 2024.

Hunter Research, *Combined Phase 1A Archaeological Study and Intensive-Level Architectural Survey: I-280 Ramps Improvement Project, Town of Harrison, Hudson County, NJ*, Prepared for Hudson County Improvement Authority and Jacobs Engineering Group. April 2013, Vols. 1 and 2.

Jonnes, Jill, *Conquering Gotham. A Gilded Age Epic: The Construction of Penn Station and Its Tunnels*, New York: Viking, 2007 pp. 13, 44, 136

Lane, Wheaton J., *From Indian Trail to Iron Horse: Travel and Transportation in New Jersey, 1620-1860*, Princeton, NJ: Princeton University Press, 1939.

New Jersey Department of Transportation, "Cultural Resources Digest," April 2016.

"The Pennsylvania Railroad Company," *Wall Street Journal* March 2, 1910, 6.

"Pennsylvania 'Short Line' to Open Soon," *Jersey Observer and Jersey Journal*, Jersey City, NJ. May 11, 1908, p. 12.

Plant, Jeremy F., editor, *Handbook of Transportation Policy and Administration*. Associate editor: Van R. Johnson; Assistant editor: Cristina E. Ciociclan. Boca Raton, FL: CRC Press, 2007.

Boyd's Directory of the District of Columbia for 1908, R.L. Polk & Co., Washington, DC. 1908.

"Popular Appointment," *Buffalo Enquirer*, Buffalo, NY: June 2, 1903, p. 6.

Portal Partners, *30% Basis of Design Report: Replacement of the Sawtooth Bridges*, Report prepared by Portal Partners for Amtrak, November 10, 2023.

"Progress of the P.R.R. Tunnel," *The Jersey City News*, Jersey City, NJ. June 2, 1906, p. 1.

"PRR Chief Engineer to Retire, Having Reached 70," *The Sun*, New York: NY, March 1, 1906: 3.

"PRR Chief Engineer to Retire Tomorrow," *Courier-Post Cherry Hill*, NJ: April 30, 1928: 3.

"Story of the Tunnels in the Making," *Times Union Brooklyn*, NY September 8, 1910.

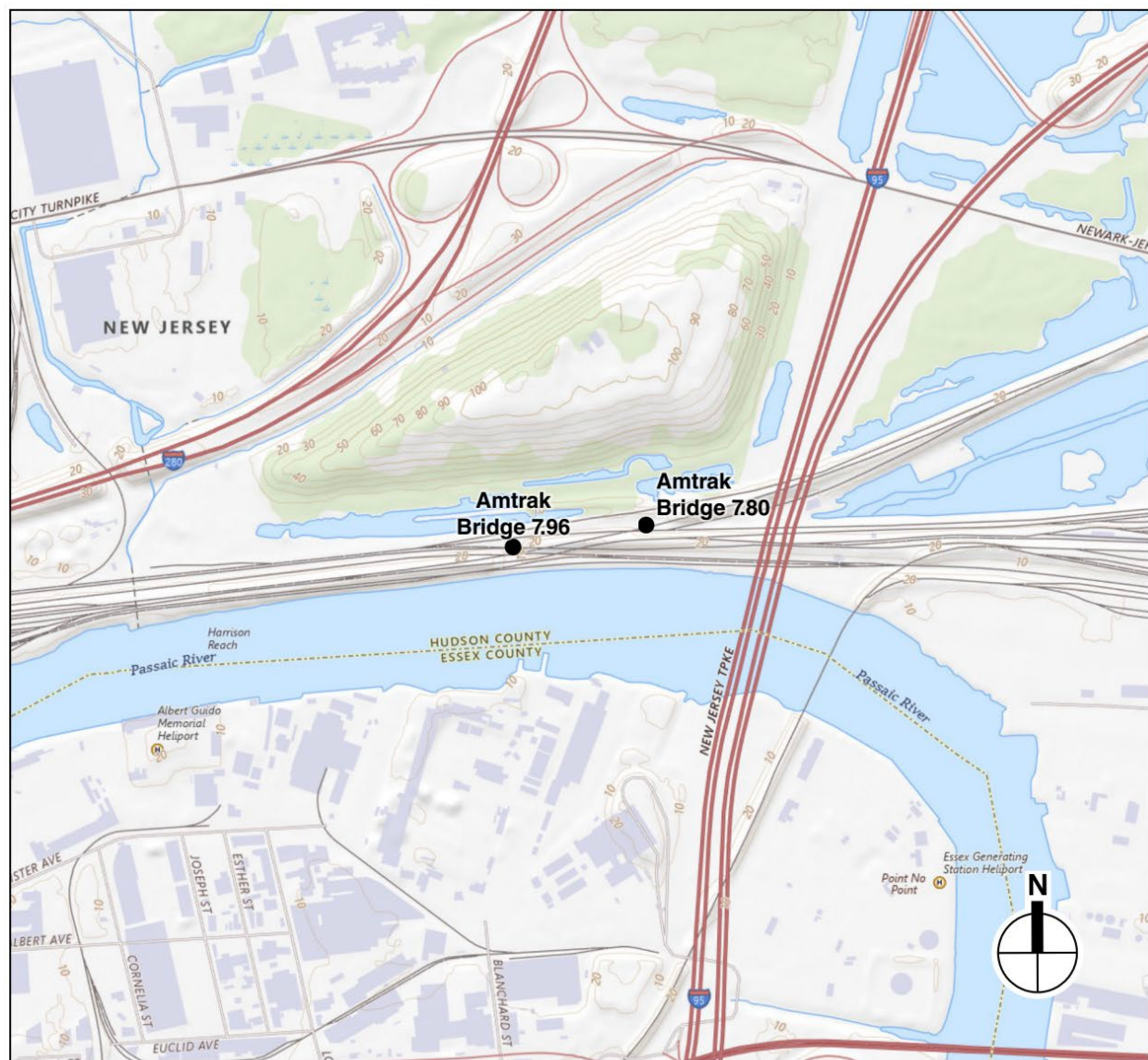
Treese, Loretta, *Railroads of New Jersey: Fragments of the Past in the Garden State Landscape*. Mechanicsburg, PA: Stackpole Books, 2006.

Van Winkle, Daniel, editor-in-chief, *History of the Municipalities of Hudson County, New Jersey 1630-1923*. Volume I, New York and Chicago: Lewis Historic Publishing Company, Inc. 1924.

C. Likely Sources Not Yet Investigated

(None known)

PENNSYLVANIA RAILROAD, AMTRAK BRIDGE NO. 7.80
(Pennsylvania Railroad, Sawtooth Bridge No. 7.80)
HAER No. NJ-160
(Page 21)



● Bridge Location

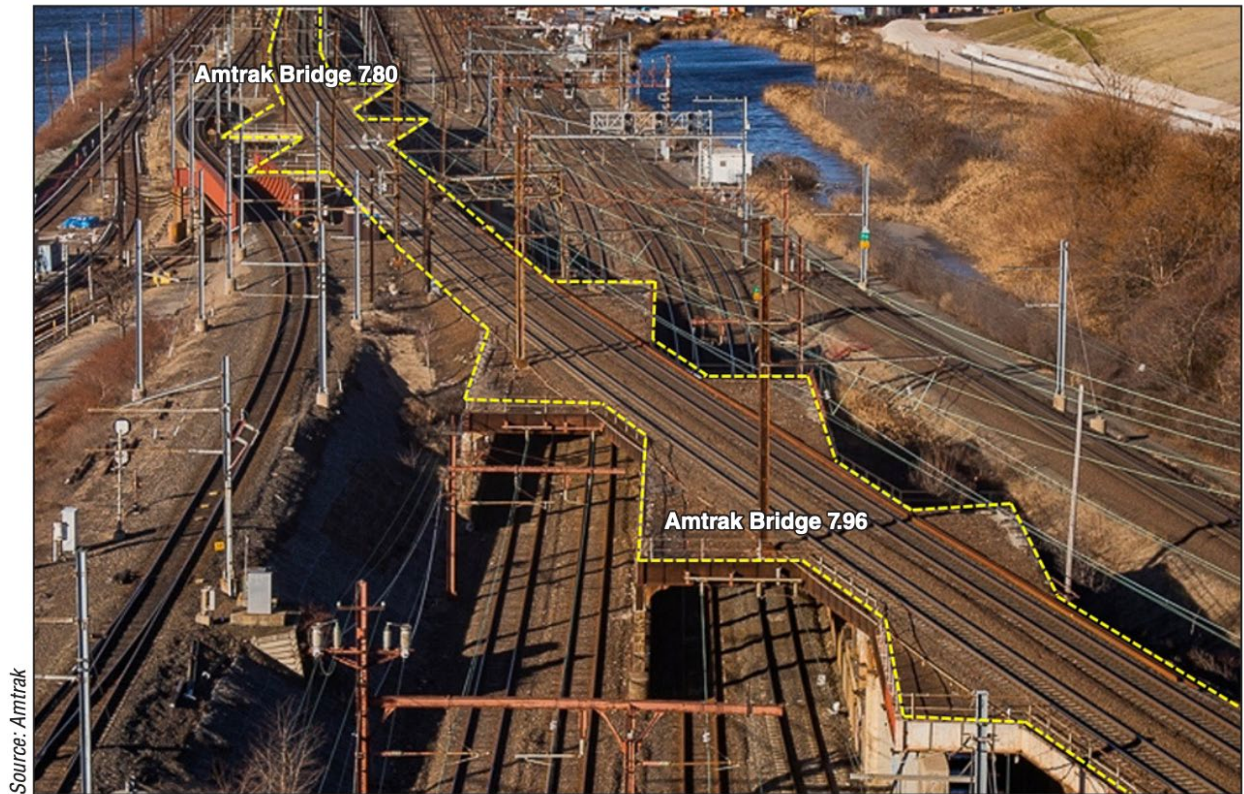
USGSTopo: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road data; Natural Earth Data; U.S. Department of State HIU; NOAA National Centers for Environmental Information

USGS Map
Figure 1



Aerial
Figure 2

PENNSYLVANIA RAILROAD, AMTRAK BRIDGE NO. 7.80
(Pennsylvania Railroad, Sawtooth Bridge No. 7.80)
HAER No. NJ-160
(Page 23)



Photograph
Figure 3

HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

PENNSYLVANIA RAILROAD, AMTRAK BRIDGE NO. 7.80
(Pennsylvania Railroad, Sawtooth Bridge No. 7.80)
Carrying two Northeast Corridor tracks over the New Jersey Transit
Corporation Morris & Essex Line
Kearny
Hudson County
New Jersey

HAER NJ-160
HAER NJ-160

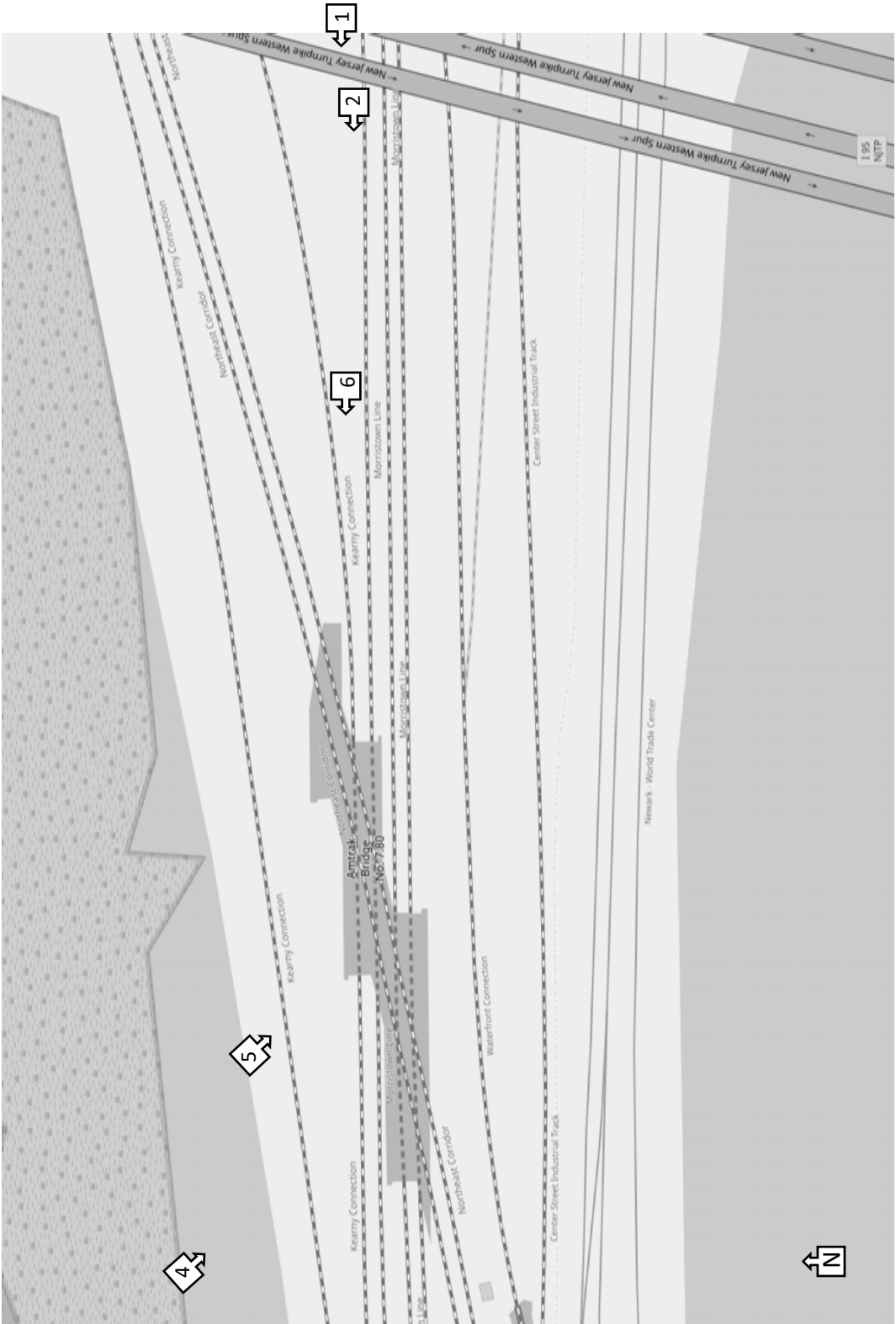
Photographer: Rob Tucher

March/April 2024

- | | |
|----------|---|
| NJ-160-1 | View of the bridge in context with a pier of the New Jersey Turnpike. View looking west. |
| NJ-160-2 | View of the bridge in context. View looking west. |
| NJ-160-3 | View of the bridge (two largely obscured portals on the far left) in context with New Jersey Transit tracks (running diagonally in the foreground), the New Jersey Turnpike (elevated horizontal structure in the background, left half of the photo) and Amtrak Bridge 7.96 (inclined wing wall and first two portals from the right). View looking southeast. |
| NJ-160-4 | Oblique view of the north elevation and west portal of the southern-most span. View looking southeast. |
| NJ-160-5 | Oblique view of the north elevation and west portal of the northern-most span. View looking southeast. |
| NJ-160-6 | East portals of both spans. View looking west. |

HISTORIC AMERICAN ENGINEERING RECORD

PHOTOGRAPH LOCATIONS



Source: OpenStreetMap.org

HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION
HAER No. NJ-160-1



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION
HAER No. NJ-160-2



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION
HAER No. NJ-160-3



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION
HAER No. NJ-160-4



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION
HAER No. NJ-160-5



HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION
HAER No. NJ-160-6

